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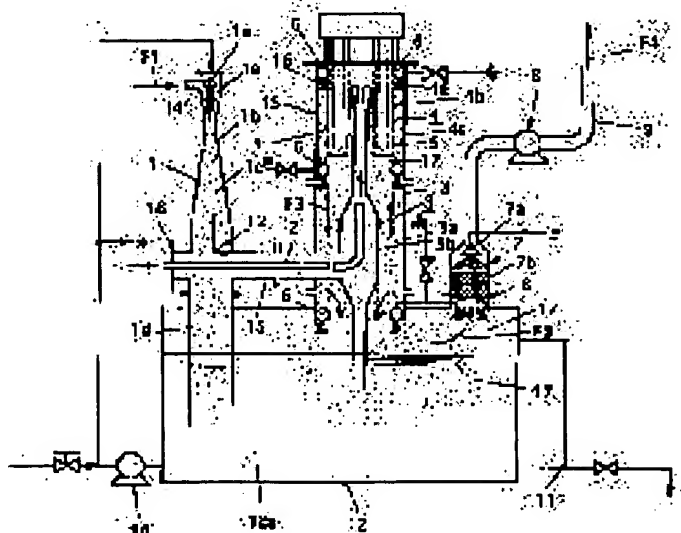
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(54) METHOD FOR REMOVING SEMICONDUCTOR PRODUCTION WASTE GAS AND DEVICE THEREFOR

(57)Abstract:

PURPOSE: To subject any waste gas to a harm removal treatment to the concentration of not more than the allowable amount of its harmful components by washing and removing dust produced by thermal decomposition of a semiconductor production waste gas which has been washed with water.

CONSTITUTION: Waste gas F1 discharged from a semiconductor producing device is washed with high pressure water in mist sprayed from a spray nozzle 1e to remove water soluble components or hydrolyzed components. Thereafter, washed waste gas F2 enters a heat exchanger body 3b and exchanges heat energy with high temp. decomposed gas F3 decomposed by oxidation in a thermal decomposition device through the wall of the heat exchanger body 3b, and enters an oxidizing thermal decomposition zone of the



thermal decomposition device 4. The washed waste gas F2 falls along the surface of an electrical rod heater 5 and is thermally decomposed. The high temp. decomposed gas '5 generates a lot of dust 17 as the oxidation treatment proceeds to accumulate it on the outer periphery of the heat exchanger body 3b. The accumulated dust 17 is removed by a dust discharge device 6.

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CLAIMS

[Claim(s)]

[Claim 1]After removing said water-soluble-materials gas or/and hydrolysis component gas for water-soluble-materials gas or semiconductor manufacture exhaust gas of hydrolysis component gas which contains either and pyrolysis constituent gas at least by rinsing, A semiconductor manufacture exhaust gas damage elimination method which decomposes pyrolysis constituent gas of rinsing exhaust gas with heating, carries out rinsing removal of the dust in pyrolysis exhaust gas emitted by a pyrolysis, and is made into pure exhaust gas.

[Claim 2]After removing said water-soluble-materials gas or/and hydrolysis component gas for water-soluble-materials gas or semiconductor manufacture exhaust gas of hydrolysis component gas which contains either and pyrolysis constituent gas at least by rinsing, In a semiconductor manufacture exhaust gas damage elimination method which decomposes pyrolysis constituent gas of rinsing exhaust gas with heating, carries out rinsing removal of the dust in pyrolysis exhaust gas emitted by a pyrolysis, and is made into pure exhaust gas, A semiconductor manufacture exhaust gas damage elimination method removing intermittently dust which rinsing exhaust gas was heated by heat exchange with a high temperature exhaust gas which carried out the pyrolysis, and was generated at the time of thermal decomposition, and was accumulated in a thermal decomposition zone at least by compression injection gas.

[Claim 3]A water scrubber from which water-soluble-materials gas or/and hydrolysis component gas in water-soluble-materials gas or semiconductor manufacture exhaust gas of hydrolysis component gas which contains either and pyrolysis constituent gas at least are removed, A thermal decomposition device which carries out the pyrolysis of the pyrolysis constituent gas in said rinsing exhaust gas, and a heat exchanger which heats said rinsing exhaust gas with said high-temperature-heat decomposition exhaust gas, A spray device from which dust in high-temperature-heat decomposition exhaust gas emitted by a pyrolysis is removed, The dust exhaust which is installed in a thermal decomposition device or a thermal decomposition device, and a heat exchanger, blows compression injection gas into an inside of a device, and discharges intermittently a thermal decomposition device or a thermal decomposition device, and dust accumulated in an inside of a heat exchanger, A semiconductor manufacture exhaust gas eliminating unit comprising a water scrubber and an air feed pipe which mixes oxygen in rinsing exhaust gas in process of either between thermal decomposition devices.

[Claim 4]The semiconductor manufacture exhaust gas eliminating unit according to claim 3 arranging around an outlet of rinsing exhaust gas which formed a heating method of a thermal decomposition device with a cylindrical heater crooked in the shape of a U character, and with which two or more cylindrical heaters were preheated in a heat exchanger within a casing of a thermal decomposition device.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]To semiconductor manufacture exhaust gas, especially a human body, make this invention detrimentally and poisonous and And an inflammability, It is related with the compact eliminating unit which generally used the metaled corrosive effective damage elimination method and the method concerned of intense exhaust gas including two or more [1 thru/or] kinds of constituent gas which has explosivity and has hydrolysis nature, and water solubility and pyrolysis nature.

[0002]

[Description of the Prior Art]After made it detrimentally and poisonous to the human body, and had an inflammability and explosivity, it makes it exhaust gas concentration become below in a lower explosive limit after diluting corrosive intense semiconductor manufacture exhaust gas with a lot of nitrogen gas to metal in general, and also mixing with the air of the overlarge, the method of emitting to the atmosphere as it is was taken. Environmental administration becomes severe with the rise of recognition to environmental protection, the above air release methods serve as a direction regulated severely, and semiconductor manufacture exhaust gas must also stop however, having to eliminate them positively this time.

[0003]Then, as a method of eliminating a damage positively, it is a scrubber method which uses ** basicity or an oxidizing (generally alkali like caustic alkali of sodium) drug solution, and washing processing of the semiconductor manufacture exhaust gas is carried out.

** Pass the layer of the adsorbent chemically combined with object exhaust gas, and carry out adsorbent removal.

** Introduce and process exhaust gas in the flame atmosphere of a lot of hydrogen gas as a dry-heating oxidation damage elimination method.

** Various methods, such as a method which introduce and makes gas, such as exhaust gas, oxygen (air), and nitrogen, decompose into [same] the tubed electric heater as an oxidation-in-the-gas-phase heating method so that it may become concentric circle shape, are proposed until now.

[0004]Though these methods had a certain feature, in addition, the problem described below is held and much more improvement was called for from the user side. Namely, although said

method ** is fit for the flue gas treatment of large air capacity, The most difficult work lowers exhaust gas components to the concentration below the amount of **** (TLV is called hereafter.) which the scope is limited to the exhaust gas of hydrolysis nature, cannot do any effect so to the exhaust gas of un-hydrolyzing nature fundamentally, and is defined globally. Usually, the actual condition is mixing the processing exhaust gas discharged by concentration higher than said TLV with the air in which size is still more superfluous, and carrying out air discharge.

[0005]It is the method of carrying out introductory processing of the gas, there is a limit in adsorption capacity, method ** needs column exchange for column-like **** according to capacity, and the burdens of a high running cost including following danger on the switching work and abandonment of adsorbent become a problem.

[0006]Although method ** is the method of making exhaust gas oxidizing in a hydrogen flame, It is attached to the hydrogen flame handling nature in the semiconductor manufacture site of what is evaluated about the completeness and the throughput of processing, and the anxiety from safety is not avoided, but this has the problem that a running cost rises, when safety is thought as important.

[0007]Although method ** uses a cylinder heating heater, this thing is difficult for heat transfer and flue-gas-treatment air capacity to exhaust gas to have a limit, and to satisfy the various necessary conditions of a semiconductor manufacture site. Removal correspondence of hydrolytic exhaust gas, acid exhaust gas, or basic exhaust gas cannot be performed, and there is a problem on use that processing of generating dust cannot fully carry out over a long time.

[0008]

[Problem(s) to be Solved by the Invention]The solution technical problem of this invention can ensure [safely and] damage elimination of the exhaust gas called for in a semiconductor manufacture site, And a running cost is cheap and it is following the many various conditions in semiconductor manufacture, and being able to be made to carry out damage elimination processing of any exhaust gas to the concentration below TLV of these ingredients as well as the ability to work stably over a long time in continuous use.

[0009]

[Means for Solving the Problem]After the 1st of this invention method removes said water-soluble-materials gas or/and hydrolysis component gas for "water-soluble-materials gas or semiconductor manufacture exhaust gas (F1) of hydrolysis component gas which contains either and pyrolysis constituent gas at least by rinsing, Heating decomposes pyrolysis constituent gas of rinsing exhaust gas (F2), rinsing removal of the dust in pyrolysis exhaust gas (F3) emitted by a pyrolysis is carried out, and it is considered as pure exhaust gas (F4).

[0010]Thereby, it can respond to damage elimination of all kinds of the semiconductor manufacture exhaust gas emitted in a semiconductor manufacture site.

[0011]After the 2nd of this invention method removes said water-soluble-materials gas or/and hydrolysis component gas for "water-soluble-materials gas or semiconductor manufacture exhaust gas (F1) of hydrolysis component gas which contains either and pyrolysis constituent gas at least by rinsing, In a semiconductor manufacture exhaust gas damage elimination method which decomposes pyrolysis constituent gas of rinsing exhaust gas (F2) with heating,

carries out rinsing removal of the dust in pyrolysis exhaust gas (F3) emitted by a pyrolysis, and is made into pure exhaust gas (F4), Rinsing exhaust gas (F2) is heated by heat exchange with a high temperature exhaust gas (F3) which carried out the pyrolysis, and it generates at the time of thermal decomposition, and is characterized by" which removes intermittently dust (17) accumulated in a thermal decomposition zone at least by compression injection gas.

[0012]There is no ** as it can respond to damage elimination of all kinds of the semiconductor manufacture exhaust gas emitted as mentioned above in a semiconductor manufacture site according to this, Heat recollection can also become possible, power consumption of an electric heater (5) can be lessened, and a running cost can be held down at a low price, And dust (17) by which it is generated with thermal decomposition of washing exhaust gas (F2) can be eliminated from a thermal decomposition zone at least, a blockade accident by dust (17) can be prevented, and it can work stably over a long time in continuous use.

[0013]A semiconductor manufacture exhaust gas eliminating unit concerning this invention, ** A water scrubber (1) from which water-soluble-materials gas or/and hydrolysis component gas in water-soluble-materials gas or semiconductor manufacture exhaust gas (F1) of hydrolysis component gas which contains either and pyrolysis constituent gas at least are removed, ** A thermal decomposition device (4) which carries out the pyrolysis of the pyrolysis constituent gas in said rinsing exhaust gas (F2), ** A heat exchanger (3) which heats rinsing exhaust gas (F2) with said high-temperature-heat decomposition exhaust gas (F3), ** A spray device (7) from which dust (17) in high-temperature-heat decomposition exhaust gas (F3) emitted by a pyrolysis is removed, ** It is installed in a thermal decomposition device (4) or a thermal decomposition device (4), and a heat exchanger (3), The dust exhaust (6) which discharges intermittently dust (17) which blew compression injection gas (16) into an inside of a device, and was accumulated in an inside of a thermal decomposition device (4) or a thermal decomposition device (4), and a heat exchanger (3), ** It is characterized by comprising an air feed pipe (2) which mixes oxygen in rinsing exhaust gas (F2) in process of either between a water scrubber (1) and a thermal decomposition device (4).

[0014]Water-soluble-materials gas or/and hydrolysis component gas in semiconductor manufacture exhaust gas (F1) are removable with a water scrubber (1) by this, It can respond to damage elimination of all kinds of the semiconductor manufacture exhaust gas can carry out the pyrolysis of the pyrolysis constituent gas in rinsing exhaust gas (F2) with a thermal decomposition device (4), and emitted in a semiconductor manufacture site. Since heat recollection also becomes possible by a heat exchanger (3), power consumption of an electric heater (5) can be lessened and a running cost can be held down at a low price. Since dust (17) in high-temperature-heat decomposition exhaust gas (F3) is removable with a spray device (7), Dust (17) is not contained in pure exhaust gas (F4) by which air discharge is carried out, and since various constituent gas is moreover falling below to TLV by said processing, environment is not spoiled by air discharge. Since a thermal decomposition device (4) or a thermal decomposition device (4), and dust (17) accumulated in an inside of a heat exchanger (3) are intermittently discharged with the dust exhaust (6), A blockade accident by dust (17) can be prevented and it can work stably over a long time in continuous use.

[0015]Claim 4 is what limited arrangement structure of a cylindrical heater (5), and a heating

method of "thermal decomposition device (4) is formed with a cylindrical heater (5) crooked in the shape of a U character, Two or more cylindrical heaters (5) are characterized by" arranged around an outlet of rinsing exhaust gas (F2) preheated by a heat exchanger (3) within a casing (4a) of a thermal decomposition device (4).

[0016]Unlike conventional system ** which uses a cylinder heating heater, a cylindrical heater (5) can be directly contacted in rinsing exhaust gas (F2) by this, High heat transfer to rinsing exhaust gas (F2) can be attained, it can be possible from small air capacity to large-air-capacity processing, and various operation conditions of a semiconductor manufacture site can be satisfied.

[0017]

[Example]Hereafter, this invention device is explained in full detail according to a graphic display example. Drawing 1 is an outline sectional view showing the flow of this invention device. In drawing 1, (1) is a water scrubber, it has connected with the semiconductor manufacturing device of a factory by the duct (14), it is used in the residual gas and the semiconductor manufacturing process which were used in the semiconductor manufacturing process, and the semiconductor manufacture exhaust gas (F1) with which the exhaust gas which passed through the various chemical change gathered is introduced here.

[0018]The water scrubber (1) is set up on the water tank (12).

It comprises a straight part (1d) following the skirt part (1c) and skirt part (1c) in which the lower part has spread following the bosh part (1a) from which the lower part was extracted, the throat part (1b) following a bosh part (1a), and the straight part (1b).

The straight part (1d) is immersed in the reservoir water (12a) of said water tank (12). The spray nozzle (1e) is installed in the ceiling part of a bosh part (1a), and injects water toward a throat part (1b).

[0019]The circulating water pump (10) is installed between the spray nozzle (1e) and the water tank (12), and the reservoir water (12a) in a water tank (12) is pumped up to a spray nozzle (1e). A city water is supplied to said circulating water pump (10), and the reservoir water (12a) and said city water of a water tank (12) are mixed and pumped up.

[0020]It is installed in one on the heat exchanger (3), and both (3) and (4) adjoin a water scrubber (1), and the thermal decomposition device (4) is installed on the water tank (12). The heat exchanger (3) comprises thermal insulation (13) wound on the periphery of the heat exchange main part (3b) stored inside cylindrical casing (3a) and cylindrical casing (3a), and cylindrical casing (3a).

The main part of a heat exchanger implement (3b) is open for free passage with the straight part (1d) of a water scrubber (1) with the communicating tube (15).

[0021]The thermal decomposition device (4) comprises thermal insulation (13) wound on the periphery of cylindrical casing (4a), and the cylindrical heater (4b) currently installed in the casing (4a) and cylindrical casing (4a).

The upper bed opening part of said heat exchanger body (3b) is carrying out the opening to the center section of the setting position of a cylindrical heater (4b), and the preheated rinsing exhaust gas (F2) is discharged by the thermal decomposition zone of a cylindrical heater (4b) installed part.

[0022]The dust exhaust (6) is a thing of the nozzle shape connected to the source of high pressure gas, and high voltage jet gas (16) spouts it from the opening. When thermal decomposition exhaust gas (F3) reacts to oxygen in the air explosively, generally inactive gas like nitrogen gas will be used for the high pressure gas spurted out inside a device, but air will be blown when it does not have explosivity. Since thermal decomposition exhaust gas (F3) is already decomposed and it does not have explosivity in this example, compressed air is used. The setting positions of the dust exhaust (6) are a ceiling part of a thermal decomposition device (4), an omitted portion and the bottom opening portion of a heat exchanger (3), and an entrance of a spray device (7) in this example.

Compression jet gas (16) is spouted downward.

The setting position of the dust exhaust (6) is not restricted to an above position, but can install now only a number required for a necessary part.

[0023]The spray device (7) is installed in the ceiling part of a water tank (12).

The thermal decomposition exhaust gas (F3) which flowed in the water tank (12) flows through the space between the ceiling part of a water tank (12), and the water surface from the bottom opening of a heat exchanger (3).

The spray device (7) has the structure where many baffles (7b) and spray nozzles (7a) were built in, for example. The exhaust duct (9) is installed in the exit of a spray device (7), and the ventilating fan (8) is installed in the middle.

[0024]As semiconductor manufacture emission gas (F1), although not restricted to this, of course, for example as hydrolytic gas For example, gas like SiH_2Cl_2 and B_2H_6 , And the simple substances of acidity like HCl, HF, and NH_3 or basic gas or these at least two mixtures are mentioned.

[0025]A deer is carried out, the semiconductor manufacture exhaust gas (F1) discharged from the semiconductor manufacturing facility is introduced into a bosh part (1a) via a duct (14), and the misty state high pressure water which blew off from the spray nozzle (1e) washes. The high pressure water which blew off from the spray nozzle (1e), in a bosh part (1a), by the rat tail and a throat part (1b), compression accelerating should be carried out and gas-liquid contact should do as semiconductor manufacture exhaust gas (F1) effectively -- it is decomposed in contact with spray water, or the water-soluble materials or the hydrolysis ingredient in semiconductor manufacture exhaust gas (F1) is dissolved and removed.

[0026]The feed water to the spray nozzle (1e) of a water scrubber (1) is performed by pumping up the reservoir water (12a) in a water tank (12) with said circulating water pump (10). In this case, in SiH_2Cl_2 contained in semiconductor manufacture exhaust gas (F1),

hydrolyze and HCl is made to generate, and it produces simultaneously, cheats out of $[\text{SiH}_2\text{O}]_x$, and is absorbed by spray water. The treated water of tales doses [drain duct / (11)] is eliminated from a water tank (12) to overflow or a pars basilaris ossis occipitalis, supplying always new water (city water) to a circulating water pump (10) to a water tank (12). An air feed pipe (2) is inserted in the heat exchanger body (3b) of a heat exchanger (3) through a communicating tube (15) from the maintenance door (18) formed in the straight part (1d) of a

water scrubber (1), and air required for oxidation thermal decomposition with an air supply pump (not shown) is supplied to washing exhaust gas, and it mixes. The concentration of the washing exhaust gas at this time (F2) is thinned below at the maximum allowable concentration of explosion.

[0027] Said air feed pipe (2) may be inserted to the entrance portion of a heat exchanger body (3b), as a solid line shows, as an imaginary line shows, it may penetrate and allocate a heat exchanger body (3b), and it may be made to mix air in the portions of a communicating tube (15) thru/or a straight part (1d) conversely. In order to make mixing of washing exhaust gas (F2) and air fully perform, it is good to mix by the straight part (1d) side, but if it thinks from the field of safety, it is desirable to penetrate and allocate a heat exchanger body (3b).

[0028] The rinsing exhaust gas (F2) washed with the water scrubber (1) enters in the heat exchanger body (3b) of a heat exchanger (3) via a communicating tube (15). Transfer of heat energy is performed by the thermal decomposition device (4) which it is mixed with air as mentioned above, and is in the device upper part here via the container wall of the pyrolysis gas (F3) in which oxidative degradation was carried out by heating at high temperature, and a heat exchanger body (3b), Where preheating temperature up is carried out, it is discharged from the upper bed opening of a heat exchanger body (3b), and it goes into the oxidation thermal decomposition zone of a thermal decomposition device (4).

[0029] As a heating method of this invention, the electric cylindrical heater (5) curved in the shape of [two or more] a U character is used, along this surface, the washing exhaust gas (F2) processed descends, and a pyrolysis is carried out. The electric cylindrical heater (5) is curved in the shape of a U character as mentioned above here.

Since two or more cylindrical heaters (5) are arranged around the outlet of a heat exchanger body (3b) within the casing (4a) of a thermal decomposition device (4), contact with an electric cylindrical heater (5) and the preheated washing exhaust gas (F2) is fully performed, and a pyrolysis is completed to the inside of a short time.

Therefore, the space of an oxidation thermal decomposition zone can be made small.

[0030] The pyrolysis exhaust gas (F3) by which oxidation treatment was carried out generates a lot of dust (17), This will accumulate on the periphery of the heat exchanger body (3b) currently installed under the periphery of an electric cylindrical heater (5), or the electric cylindrical heater (5), and the dust exhaust (6) removes deposition dust (17) so that it may mention later.

[0031] Rinsing exhaust gas (F2) descends toward a heat exchanger (3) from a thermal decomposition device (4) as mentioned above, generating a lot of dust (17) with advance of oxidation treatment, The rinsing exhaust gas (F2) which is going up the inside of a heat exchanger body (3b) from the periphery through the container wall of a heat exchanger body (3b) is heated. Thus, the thermal decomposition exhaust gas (F3) which finished heat exchange enters in a water tank (12) from the opening of a heat exchanger (3), and is introduced in a spray device (7) through the space between the ceiling surface of a water tank (12), and the water surface. Introduction of the decomposition exhaust gas (F3) to a spray device (7) is performed by the suction effect of a ventilating fan (8).

[0032] Although adhesion accumulation of said some of dust (17) is carried out into an electric cylindrical heater (5) and a heat exchanger (3), most descends with pyrolysis exhaust gas

(F3), and the most pours and sinks on the reservoir water (12a) in a water tank (12). [0033]it will rinse effectively with watering and the baffle (7b) from a spray nozzle (7a), and heat will be taken, and the decomposition exhaust gas (F3) containing the dust (17) introduced into the spray device (7) will serve as low temperature, will turn into pure low-temperature exhaust gas (F4), and air discharge will be carried out from an exhaust duct (9). [0034]In this invention device, as mentioned above, it is generated by oxide powder dust mainly inside a thermal decomposition device (4), adhesion accumulation is carried out to the inside of a thermal decomposition device (4) and a heat exchanger (3) with time during an oxidation thermal decomposition reaction, and there is a danger of blockading a channel. The dust exhaust (6) formed in the high pressure gas injection nozzle as mentioned above as the measure The upper bed of a thermal decomposition device (4), It installs in the opening of a heat exchanger (3), and high pressure air or nitrogen gas can be intermittently blown off inside a thermal decomposition device (4) and a heat exchanger (3), deposition dust (17) is dropped, and it drops into a water tank (12). The dropped dust (17) is usually fine powder form, and although it is floating on the water surface at the beginning, it comes to distribute it in reservoir water (12a) with time. Some reservoir water (12a) in a water tank (12) is discharged out of a water tank (12) through a drain duct (11). In this case, a filter (not shown) is installed in front of a drain duct (11) if needed, and it may be made to remove dust as a solid.

[0035]In this invention device, rinsing exhaust gas (F2) can be preheated by installation of a heat exchanger (3), heat recollection can become possible, and the heat energy burden placed on an electric heater (5) can be reduced substantially. When carrying out damage elimination processing of semiconductor manufacture exhaust gas (F1) with this invention device, although the skin temperature of an electric heater (5) is set as 600-900 **, by a heat exchanger (3), 20 to 30% of saving of use energy can be attained, and the running cost of semiconductor manufacture can usually be reduced.

[0036](Example of an experiment) As the ratio of the surface area / thermal decomposition zone wall surface product of an electric heater (5) was set as 1 and it was shown in the following table, it experimented in SiH_4 of various concentration with various air capacity. It checked that SiH_4 could be eliminated below to the TLV on the following operating conditions to the designed eliminating unit in any case.

<<Table 1>>

Introductory SiH_4 concentration Introductory gas all air-capacity (exhaust gas + air) heater temperature Concentration (ppm) (L/min) of SiH_4 in exhaust gas (**) 500 (ppm) 1,000 850 < 51,000 500 650. <53,000 1,000 900 <55,000 500 800 <5[0037]

[Effect of the Invention]After this invention method removes said water-soluble-materials gas or/and hydrolysis component gas for water-soluble-materials gas or the semiconductor manufacture exhaust gas of hydrolysis component gas which contains either and pyrolysis constituent gas at least by rinsing, Since heating decomposes the pyrolysis constituent gas of rinsing exhaust gas, rinsing removal of the dust in the pyrolysis exhaust gas emitted by the pyrolysis is carried out and it is considered as pure exhaust gas, it can respond to damage elimination of all kinds of the semiconductor manufacture exhaust gas emitted in a

semiconductor manufacture site. Since rinsing exhaust gas is heated by heat exchange with the high temperature exhaust gas which carried out the pyrolysis, Since compression injection gas removes intermittently the dust which could lessen power consumption, and could hold down the running cost at a low price, and was accumulated in the thermal decomposition zone at least, The blockade accident by the dust of a thermal decomposition zone can be prevented, and it can set to continuous use again, and can work stably over a long time. It not only can respond to damage elimination of all kinds of the semiconductor manufacture exhaust gas emitted in a semiconductor manufacture site, but [since it is / a semiconductor manufacture exhaust gas eliminating unit / the above composition,], It not only can attain reduction of a running cost, dust[non-]-izing of the pure exhaust gas by which air discharge is carried out, and TLV, but continuous long time stable operation becomes possible. By devising the arrangement structure of a cylindrical heater, high heat transfer to rinsing exhaust gas can be attained, and there is an advantage that it can be possible from small air capacity to large-air-capacity processing, and the various operation conditions of a semiconductor manufacture site can be satisfied.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The outline sectional view showing the flow of one example of this invention device

[Description of Notations]

(F1) -- Semiconductor manufacture exhaust gas

(F2) -- Rinsing exhaust gas

(F3) -- Pyrolysis exhaust gas

(F4) -- Pure exhaust gas

[Translation done.]

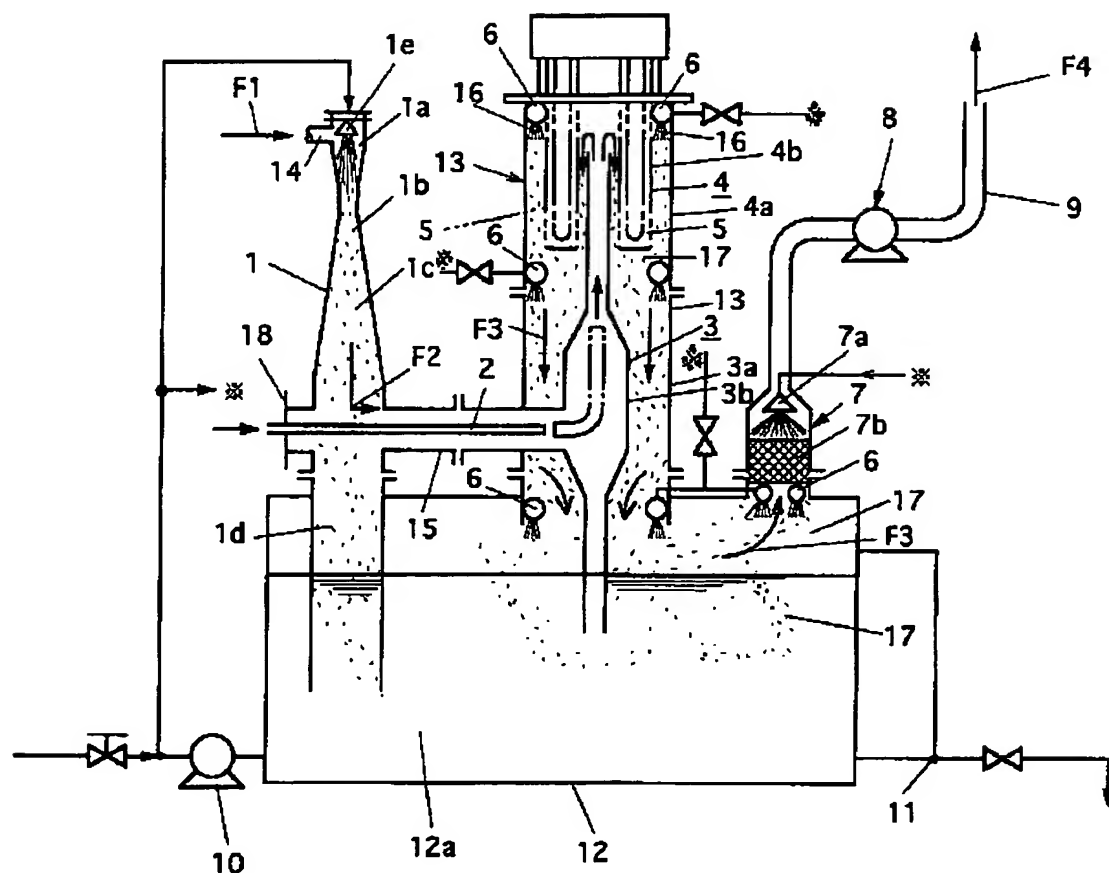
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DRAWINGS

[Drawing 1]



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WRITTEN AMENDMENT

----- [Written amendment]

[Filing date]July 6, Heisei 6

[Amendment 1]

[Document to be Amended]Specification

[Item(s) to be Amended]0018

[Method of Amendment]Change

[Proposed Amendment]

[0018]The water scrubber (1) is set up on the water tank (12).

It comprises a straight part (1d) following the skirt part (1c) and skirt part (1c) in which the lower part has spread following the bosh part (1a) from which the lower part was extracted, the throat part (1b) following a bosh part (1a), and the straight part (1d).

The straight part (1d) is immersed in the reservoir water (12a) of said water tank (12). The spray nozzle (1e) is installed in the ceiling part of a bosh part (1a), and injects water toward a throat part (1b).

[Amendment 2]

[Document to be Amended]Specification

[Item(s) to be Amended]0021

[Method of Amendment]Change

[Proposed Amendment]

[0021]The thermal decomposition device (4) comprises thermal insulation (13) wound on the periphery of cylindrical casing (4a), and the cylindrical heater (4b) currently installed in the casing (4a) and cylindrical casing (4a).

The upper bed opening part of said heat exchanger body (3b) is carrying out the opening to the center section of the setting position of a cylindrical heater (5), and the preheated rinsing exhaust gas (F2) is discharged by the thermal decomposition zone of a cylindrical heater (4b) installed part.

[Translation done.]